Attachment 1

Optional Formats for the Texas Essential Knowledge and Skills

Attached are optional formats for the TEKS as shown in Grade 5 mathematics (July 1996 draft). Also attached is the format required by the Texas Administrative Code for rules, as exemplified in the Algebra I TEKS adopted by the Board in July 1996.

The following is a comparison of Options A, B, C, and Current:

	Option A	**Option B**	**Option C**	**Current Option**
Format	•Basic Understandings, Knowledge and Skills, & Performance Descriptions in outline format	•Basic Understandings listed •Knowledge and Skills & Performance Descriptions in running columns	•Basic Understandings in synthesized paragraphs •Knowledge and Skills & Performance Descriptions in running columns	•Basic Understandings in paragraphs •Knowledge and Skills & Performance Descriptions in side-by-side landscape columns
Elements	•Basic Understandings •Knowledge & Skills •Perf. Descriptions	•Knowledge & Skills •Perf. Descriptions	•Knowledge & Skills •Perf. Descriptions	Undetermined
No. of Pages Math	4	3	3	6

Texas Essential Knowledge and Skills for Mathematics

A. Basic Understandings for Grades 3-5

Element 1. **Number, Operation, and Quantitative Reasoning**. Algorithms are generalizations developed from concrete experiences in meaningful contexts and are efficient ways to perform basic operations. The concept of fractions and decimals is critical in ordering, labeling, and expressing relationships beyond the set of whole numbers. Students use algorithms to add, subtract, multiply, and divide whole numbers, and they concretely develop basic concepts of part-to-whole relationships.

" 2. **Patterns, Relationships, and Algebraic Thinking**. Analyzing patterns leads to discovering and describing relationships. Students use appropriate language and organizational structures, such as tables and charts, to represent and communicate relationships, make predictions, and solve problems.

" 3. **Geometry and Spatial Reasoning**. Spatial reasoning is necessary to discern similarities, differences, and unique attributes of geometric figures in two and three dimensions. Students use formal language to describe their reasoning as they identify, compare, and classify figures.

" 4. **Measurement**. The measurement process involves the selection of appropriate units and tools. Students use numbers, standard units, and measurement tools to describe and compare objects, make estimates, and solve application problems.

" 5. **Probability and Statistics**. Data collection is a powerful way to determine the likelihood of an event occurring. Students organize data, choose an appropriate method to display the data, and interpret the data to make decisions and predictions and to solve problems.

" 6. **Underlying Mathematical Processes**. Many processes underlie all content areas in mathematics. Problem solving, language and communication, connections within and outside mathematics, and formal and informal reasoning must be woven into each of the other basic understandings. Students also will use technology and multiple representations as they do mathematics.

B. Grade 5. Knowledge and Skills and Performance Descriptions.

Element 1. The student uses place value to express whole numbers and decimals. To demonstrate proficiency, the student:

Element a. uses place value to read, write, and describe whole numbers through the millions period and decimals through the thousandths place;

" b. uses place value to compare and order whole numbers through the millions period; and

" c. compares and orders decimals involving tenths, hundredths, and thousandths.

Element 2. The student represents and uses fractions in problem-solving situations. To demonstrate proficiency, the student:

Element a. finds equivalent fractions;

b. uses equivalent fractions to find common denominators for two fractional quantities in order to compare them in problem-solving situations;
c. uses models to relate decimals to fractions that name tenths, hundredths, and thousandths; and
d. uses fractions as a way to represent the concept of ratio.

3. The student uses addition, subtraction, multiplication, and division to solve meaningful problems. To demonstrate proficiency, the student:
   a. selects and uses addition and subtraction strategies, algorithms, and technology to solve problems involving whole numbers and decimals;
   b. selects and uses multiplication facts, strategies, algorithms, and technology to solve problems involving whole numbers; (No more than three digits times two digits without technology;)
   c. selects and uses division facts, strategies, algorithms, and technology to solve problems involving whole numbers; (No more than two-digit divisors and three-digit dividends without technology;)
   d. uses multiplication and division to find prime factors of a whole number or common factors of a set of whole numbers; and
   e. uses concrete and pictorial models to add and subtract fractions with like denominators in problem-solving situations.

4. The student uses estimation as a tool for determining reasonable results. To demonstrate proficiency, the student:
   a. identifies and describes situations in which an estimate or an exact answer is preferred;
   b. uses estimation to solve problems where exact answers are not required; and
   c. uses rounding as a tool for estimating reasonable results of problem situations using whole numbers and decimals.

5. The student makes generalizations based on observed patterns and relationships. To demonstrate proficiency, the student:
   a. describes a pattern to generate the rules of divisibility (2, 3, 4, 5, 6, 9, 10);
   b. uses lists, tables, or diagrams to find patterns in equivalent fractions;
   c. uses patterns to multiply by powers of ten; and
   d. uses concrete models and patterns in factor pairs to identify prime and composite numbers.

6. The student uses mathematical representations to express relationships. To demonstrate proficiency, the student:
   a. uses diagrams or number sentences to represent real-life situations; and
   b. finds patterns and makes generalizations from charts and tables.

7. The student uses critical attributes to generate geometric definitions. To demonstrate proficiency, the student:
   a. identifies the critical attributes of geometric shapes or solids;

b. uses critical attributes to define geometric shapes or solids; and
c. identifies angles greater than or less than right angles.

8. The student uses transformations to make and identify geometric patterns. To demonstrate proficiency, the student:
   a. uses translations, reflections, and rotations to make geometric patterns, using technology where appropriate; and
   b. identifies patterns created by translations, reflections, and rotations.

9. The student understands that ordered pairs can be used to describe locations of points. To demonstrate proficiency, the student uses ordered pairs of whole numbers to locate or name points on a coordinate grid.

10. The student recognizes the attribute volume and measures volume. To demonstrate proficiency, the student:
    a. measures volume using concrete models of cubic units; and
    b. estimates volume in cubic units.

11. The student applies measurement concepts. To demonstrate proficiency, the student:
    a. uses measurement procedures to solve problems involving length, weight, capacity, time, temperature, and area; and
    b. uses ratio to describe relationships between units of measure within the same measurement system.

12. The student uses probability to describe the experimental results of a simple event. To demonstrate proficiency, the student:
    a. uses fractions to describe the experimental results of a simple event; and
    b. uses the experimental probabilities to make predictions.

13. The student describes and compares sets of data in a variety of ways. To demonstrate proficiency, the student uses mode, median, and range to describe and compare sets of data.

14. The student solves problems by collecting, organizing, displaying, and interpreting sets of data. To demonstrate proficiency, the student:
    a. uses tables of related number pairs to make line graphs; and
    b. interprets and compares information from circle, bar, and line graphs.

15. The student solves problems that arise from everyday experiences and investigations in other disciplines. To demonstrate proficiency, the student:
    a. solves problems using a problem-solving model that incorporates understanding the problem, making a plan, carrying out the plan, and looking back to evaluate the solution;
    b. selects or develops an appropriate problem-solving strategy, including draw a picture, look for a pattern, systematic guess and check, act it out, make a table, work a simpler problem, or work backwards to solve problems; and
    c. selects tools, such as real objects, manipulatives, and technology, to solve problems.

16. The student communicates using informal and formal vocabulary and symbols. To demonstrate proficiency, the student:
    a. explains and records his or her reasoning using objects, words, pictures, symbols, and/or technology; and
    b. describes everyday situations using mathematical language and symbols.

17. The student uses logical reasoning to justify conclusions and solution processes. To demonstrate proficiency, the student:
    a. justifies why an answer is reasonable; and
    b. makes generalizations from patterns or sets of examples and nonexamples created with appropriate tools.

18. The student connects mathematics to everyday experiences, to activities in and outside of school, and with other disciplines. To demonstrate proficiency, the student identifies and applies mathematics in everyday situations and other disciplines.

Mathematics

Basic Understandings for Grade 3 through Grade 5.

Not an Element (1) **Number, Operation, and Quantitative Reasoning** : Algorithms are generalizations developed from concrete experiences in meaningful contexts and are efficient ways to perform basic operations. The concept of fractions and decimals is critical in ordering, labeling, and expressing relationships beyond the set of whole numbers. Students use algorithms to add, subtract, multiply, and divide whole numbers, and they concretely develop basic concepts of part-to-whole relationships.

" (2) **Patterns, Relationships, and Algebraic Thinking** : Analyzing patterns leads to discovering and describing relationships. Students use appropriate language and organizational structures, such as tables and charts, to represent and communicate relationships, make predictions, and solve problems.

" (3) **Geometry and Spatial Reasoning** : Spatial reasoning is necessary to discern similarities, differences, and unique attributes of geometric figures in two and three dimensions. Students use formal language to describe their reasoning as they identify, compare, and classify figures.

" (4) **Measurement**: The measurement process involves the selection of appropriate units and tools. Students use numbers, standard units, and measurement tools to describe and compare objects, make estimates, and solve application problems.

" (5) **Probability and Statistics** : Data collection is a powerful way to determine the likelihood of an event occur ring. Students organize data, choose an appropriate method to display the data, and interpret the data to make decisions and predictions and to solve problems.

" (6) **Underlying Mathematical Processes** : Many processes underlie all content areas in mathematics. Problem solving, language and communication, connections within and outside mathematics, and formal and informal reasoning must be woven into each of the other basic understandings. Students also will use technology and multiple representations as they do mathematics.

Grade Five

Not an Element **Number, Operation, and Quantitative Reasoning**

Element 5.1 The student uses place value to express whole numbers and decimals. The student:

Element a. uses place value to read, write, and describe whole numbers through the millions period and decimals through the thousandths place;

" b. uses place value to compare and order whole numbers through the millions period; and

Element c. compares and orders decimals involving tenths, hundredths, and thousandths.

Element 5.2 The student represents and uses fractions in problem-solving situations. The student:

Element a. finds equivalent fractions;

" b. uses equivalent fractions to find common denominators for two fractional quantities in order to

compare them in problem-solving situations;

" c. uses models to relate decimals to fractions that name tenths, hundredths, and thousandths; and

d. uses fractions as a way to represent the concept of ratio.

5.3 The student uses addition, subtraction, multiplication, and division to solve meaningful problems. The student:

a. selects and uses addition and subtraction strategies, algorithms, and technology to solve problems involving whole numbers and decimals;

b. selects and uses multiplication facts, strategies, algorithms, and technology to solve problems involving whole numbers; (No more than three digits times two digits without technology;)

c. selects and uses division facts, strategies, algorithms, and technology to solve problems involving whole numbers; (No more than two-digit divisors and three-digit dividends without technology;)

d. uses multiplication and division to find prime factors of a whole number or common factors of a set of whole numbers; and

e. uses concrete and pictorial models to add and subtract fractions with like denominators in problem-solving situations.

5.4 The student uses estimation as a tool for determining reasonable results. The student:

a. identifies and describes situations in which an estimate or an exact answer is preferred;

b. uses estimation to solve problems where exact answers are not required; and

c. uses rounding as a tool for estimating reasonable results of problem situations using whole numbers and decimals.

Pattern, Relationships, and Algebraic Thinking

5.5 The student makes generalizations based on observed patterns and relationships. The student:

a. describes a pattern to generate the rules of divisibility (2, 3, 4, 5, 6, 9, 10);

b. uses lists, tables, or diagrams to find patterns in equivalent fractions;

c. uses patterns to multiply by powers of ten; and

d. uses concrete models and patterns in factor pairs to identify prime and composite numbers.

5.6 The student uses mathematical representations to express relationships. The student:

a. uses diagrams or number sentences to represent real-life situations; and

b. finds patterns and makes generalizations from charts and tables.

Geometry and Spatial Reasoning

5.7 The student uses critical attributes to generate geometric definitions. The student:

a. identifies the critical attributes of geometric shapes or solids;

b. uses critical attributes to define geometric shapes or solids; and

c. identifies angles greater than or less than right angles.

5.8 The student uses transformations to make and identify geometric patterns. The student:

a. uses translations, reflections, and rotations to make geometric patterns, using technology where appropriate; and

b. identifies patterns created by translations, reflections, and rotations.

5.9 The student understands that ordered pairs can be used to describe locations

of points. The student uses ordered pairs of whole numbers to locate or name points on a coordinate grid.

Measurement

5.10 The student recognizes the attribute volume and measures volume. The student:
- a. measures volume using concrete models of cubic units; and
- b. estimates volume in cubic units.

5.11 The student applies measurement concepts. The student:
- a. uses measurement procedures to solve problems involving length, weight, capacity, time, temperature, and area; and
- b. uses ratio to describe relationships between units of measure within the same measurement system.

Probability and Statistics

5.12 The student uses probability to describe the experimental results of a simple event. The student:
- a. uses fractions to describe the experimental results of a simple event; and
- b. uses the experimental probabilities to make predictions.

5.13 The student describes and compares sets of data in a variety of ways. The student uses mode, median, and range to describe and compare sets of data.

5.14 The student solves problems by collecting, organizing, displaying, and interpreting sets of data. The student:
- a. uses tables of related number pairs to make line graphs; and
- b. interprets and compares information from circle, bar, and line graphs.

Underlying Mathematical Processes

5.15 The student solves problems that arise from everyday experiences and investigations in other disciplines. The student:
- a. solves problems using a problem-solving model that incorporates understanding the problem, making a plan, carrying out the plan, and looking back to evaluate the solution;
- b. selects or develops an appropriate problem-solving strategy, including draw a picture, look for a pattern, systematic guess and check, act it out, make a table, work a simpler problem, or work backwards to solve problems; and
- c. selects tools, such as real objects, manipulatives, and technology, to solve problems.

5.16 The student communicates using informal and formal vocabulary and symbols. The student:
- a. explains and records his or her reasoning using objects, words, pictures, symbols, and/or technology; and
- b. describes everyday situations using mathematical language and symbols.

5.17 The student uses logical reasoning to justify conclusions and solution processes. The student:
- a. justifies why an answer is reasonable; and
- b. makes generalizations from patterns or sets of examples and nonexamples created with appropriate tools.

5.18 The student connects mathematics to everyday experiences, to activities in and outside of school, and with other disciplines. The student identifies and applies mathematics in everyday situations and other disciplines.

Mathematics

Grade 5

Not an Element In Grade 5 students add, subtract, multiply, and divide whole numbers, and they concretely develop basic concepts of part-to-whole relationships. Students use appropriate language and organizational structures, such as tables and charts, to represent and communicate relationships, make predictions, and solve problems. Students use formal language to describe their reasoning as they identify, compare, and classify figures. Students use numbers, standard units, and measurement tools to describe and compare objects, make estimates, and solve application problems. Students organize data, choose an appropriate method to display the data, and interpret the data to make decisions and predictions and to solve problems.

" Problem solving, language and communication, connections within and outside mathematics, and formal and informal reasoning are woven throughout the curriculum. Students use technology where appropriate in concept development and problem solving.

Not an Element **Number, Operation, and Quantitative Reasoning**

Element 5.1 The student uses place value to express whole numbers and decimals. The student:

Element a. uses place value to read, write, and describe whole numbers through the millions period and decimals through the thousandths place;

" b. uses place value to compare and order whole numbers through the millions period; and

" c. compares and orders decimals involving tenths, hundredths, and thousandths.

Element 5.2 The student represents and uses fractions in problem-solving situations. The student:

Element a. finds equivalent fractions;

" b. uses equivalent fractions to find common denominators for two fractional quantities in order to compare them in problem-solving situations;

" c. uses models to relate decimals to fractions that name tenths, hundredths, and thousandths; and

" d. uses fractions as a way to represent the concept of ratio.

Element 5.3 The student uses addition, subtraction, multiplication, and division to solve meaningful problems. The student:

Element a. selects and uses addition and subtraction strategies, algorithms, and technology to solve problems involving whole numbers and decimals;

" b. selects and uses multiplication facts, strategies, algorithms, and technology to solve problems involving whole numbers; (No more than three digits times two digits without technology;)

" c. selects and uses division facts, strategies, algorithms, and technology to solve problems involving whole numbers; (No more than two-digit divisors and three-digit dividends without technology;)

" d. uses multiplication and division to find prime factors

of a whole number or common factors of a set of whole numbers; and

" e. uses concrete and pictorial models to add and subtract fractions with like denominators in problem-solving situations.

5.4 The student uses estimation as a tool for determining reasonable results. The student:

a. identifies and describes situations in which an estimate or an exact answer is preferred;
b. uses estimation to solve problems where exact answers are not required; and
c. uses rounding as a tool for estimating reasonable results of problem situations using whole numbers and decimals.

Pattern, Relationships, and Algebraic Thinking

5.5 The student makes generalizations based on observed patterns and relationships. The student:

a. describes a pattern to generate the rules of divisibility (2, 3, 4, 5, 6, 9, 10);
b. uses lists, tables, or diagrams to find patterns in equivalent fractions;
c. uses patterns to multiply by powers of ten; and
d. uses concrete models and patterns in factor pairs to identify prime and composite numbers.

5.6 The student uses mathematical representations to express relationships. The student:

a. uses diagrams or number sentences to represent real-life situations; and
b. finds patterns and makes generalizations from charts and tables.

Geometry and Spatial Reasoning

5.7 The student uses critical attributes to generate geometric definitions. The student:

a. identifies the critical attributes of geometric shapes or solids;
b. uses critical attributes to define geometric shapes or solids; and
c. identifies angles greater than or less than right angles.

5.8 The student uses transformations to make and identify geometric patterns. The student:

a. uses translations, reflections, and rotations to make geometric patterns, using technology where appropriate; and
b. identifies patterns created by translations, reflections, and rotations.

5.9 The student understands that ordered pairs can be used to describe locations of points. The student uses ordered pairs of whole numbers to locate or name points on a coordinate grid.

Measurement

5.10 The student recognizes the attribute volume and measures volume. The student:

a. measures volume using concrete models of cubic units; and
b. estimates volume in cubic units.

5.11 The student applies measurement concepts. The student:

a. uses measurement procedures to solve problems involving length, weight, capacity, time, temperature, and area; and
b. uses ratio to describe relationships between units of measure within the same measurement system.

Probability and Statistics

5.12 The student uses probability to describe the experimental results of a simple event. The student:
- a. uses fractions to describe the experimental results of a simple event; and
- b. uses the experimental probabilities to make predictions.

5.13 The student describes and compares sets of data in a variety of ways. The student uses mode, median, and range to describe and compare sets of data.

5.14 The student solves problems by collecting, organizing, displaying, and interpreting sets of data. The student:
- a. uses tables of related number pairs to make line graphs; and
- b. interprets and compares information from circle, bar, and line graphs.

Underlying Mathematical Processes

5.15 The student solves problems that arise from everyday experiences and investigations in other disciplines. The student:
- a. solves problems using a problem-solving model that incorporates understanding the problem, making a plan, carrying out the plan, and looking back to evaluate the solution;
- b. selects or develops an appropriate problem-solving strategy, including draw a picture, look for a pattern, systematic guess and check, act it out, make a table, work a simpler problem, or work backwards to solve problems; and
- c. selects tools, such as real objects, manipulatives, and technology, to solve problems.

5.16 The student communicates using informal and formal vocabulary and symbols. The student:
- a. explains and records his or her reasoning using objects, words, pictures, symbols, and/or technology; and
- b. describes everyday situations using mathematical language and symbols.

5.17 The student uses logical reasoning to justify conclusions and solution processes. The student:
- a. justifies why an answer is reasonable; and
- b. makes generalizations from patterns or sets of examples and nonexamples created with appropriate tools.

5.18 The student connects mathematics to everyday experiences, to activities in and outside of school, and with other disciplines. The student identifies and applies mathematics in everyday situations and other disciplines.

CONTENT AREA: MATHEMATICS

GRADE LEVEL: 5

BASIC UNDERSTANDING

A. Number, Operation, and Quantitative Reasoning: Algorithms are generalizations developed from concrete experiences in meaningful contexts and are efficient ways to perform basic operations. The concept of fractions and decimals is critical in ordering, labeling, and expressing relationships beyond the set of whole numbers. Students use algorithms to add, subtract, multiply, and divide whole numbers, and they concretely develop basic concepts of part-to-whole relationships.

KNOWLEDGE AND SKILLS	PERFORMANCE DESCRIPTIONS
1. The student uses place value to express whole numbers and decimals.	1.a. The student uses place value to read, write, and describe whole numbers through the millions period and decimals through the thousandths place. 1.b. The student uses place value to compare and order whole numbers through the millions period. 1.c. The student compares and orders decimals involving tenths, hundredths, and thousandths
2. The student represents and uses fractions in problem-solving situations.	2.a. The student finds equivalent fractions. 2.b. The student uses equivalent fractions to find common denominators for two fractional quantities in order to compare them in problem-solving situations. 2.c. The student uses models to relate decimals to fractions that name tenths, hundredths, and thousandths. 2.d. The student uses fractions as a way to represent the concept of ratio.
3. The student uses addition, subtraction, multiplication, and division to solve meaningful problems.	3.a. The student selects and uses addition and subtraction strategies, algorithms, and technology to solve problems involving whole numbers and decimals.

GRADE LEVEL: 5 **CONTENT AREA:** MATHEMATICS

KNOWLEDGE AND SKILLS	PERFORMANCE DESCRIPTIONS
	3.b. The student selects and uses multiplication facts, strategies, algorithms, and technology to solve problems involving whole numbers. (No more than three digits times two digits without technology.)
	3.c. The student selects and uses division facts, strategies, algorithms, and technology to solve problems involving whole numbers. (No more than two-digit divisors and three-digit dividends without technology.)
	3.d. The student uses multiplication and division to find prime factors of a whole number or common factors of a set of whole numbers.
	3.e. The student uses concrete and pictorial models to add and subtract fractions with like denominators in problem-solving situations.
4. The student uses estimation as a tool for determi ning reasonable results.	4.a. The student identifies and describes situations in which an estimate or an exact answer is preferred.
	4.b. The student uses estimation to solve problems where exact answers are not required.
	4.c. The student uses rounding as a tool for estimating reasonable results of problem situations using whole numbers and decimals.

BASIC UNDERSTANDING

B. Patterns, Relationships, and Algebraic Thinking: Analyzing patterns leads to discovering and describing relationships. Students u se appropriate language and organizational structures, such as tables and charts, to represent and communicate relationships, make predictions, and solve problems.

GRADE LEVEL: 5 **CONTENT AREA:** MATHEMATICS

KNOWLEDGE AND SKILLS	PERFORMANCE DESCRIPTIONS
5. The student makes generalizations based on observed patterns and relationships.	5.a. The student describes a pattern to generate the rules of divisibility (2, 3, 4, 5, 6, 9, 10). 5.b. The student uses lists, tables, or diagrams to find patterns in equivalent fractions. 5.c. The student uses patterns to multiply by powers of ten. 5.d. The student uses concrete models and patterns in factor pairs to identify prime and composite numbers.
6. The student uses mathematical representations to express relationships.	6.a. The student uses diagrams or number sentences to represent real-life situations. 6.b. The student finds patterns and makes generalizations from charts and tables.

BASIC UNDERSTANDING

C. Geometry and Spatial Reasoning**:** Spatial reasoning is necessary to discern similarities, differences, and unique attributes of geometric figures in two and three dimensions. Students use formal language to describe their reasoning as they identify, compare, and classify figures.

KNOWLEDGE AND SKILLS	PERFORMANCE DESCRIPTIONS
7. The student uses critical attributes to generate geometric definitions.	7.a. The student identifies the critical attributes of geometric shapes or solids. 7.b. The student uses critical attributes to define geometric sh apes or solids. 7.c. The student identifies angles greater than or less than right angles.

GRADE LEVEL: 5 **CONTENT AREA:** MATHEMATICS

KNOWLEDGE AND SKILLS	PERFORMANCE DESCRIPTIONS
8. The student uses transformations to make and identify geometric patterns.	8.a. The student uses translations, reflections, and rotations to make geometric patterns, using technology where appropriate. 8.b. The student identifies patterns created by translations, reflections, and rotations.
9. The student understands that ordered pairs can be used to describe locations of points.	9.a. The student uses ordered pairs of whole numbers to locate or name points on a coordinate grid.

BASIC UNDERSTANDING

D. Measurement: The measurement process involves the selection of appropriate units and tools. Students use numbers, standard units, and measurement tools to describe and compare objects, make estimates, and solve application problems.

KNOWLEDGE AND SKILLS	PERFORMANCE DESCRIPTIONS
10. The student recognizes the attribute volume and measures volume.	10.a. The student measures volume using concrete models of cubic units. 10.b. The student estimates volume in cubic units.
11. The student applies measurement concepts.	11.a. The student uses measurement procedures to solve problems involving length, weight, capacity, time, temperature, and area. 11.b. The student uses ratio to describe relationships between units of measure within the same measurement system.

GRADE LEVEL: 5 **CONTENT AREA:** MATHEMATICS

BASIC UNDERSTANDING

E. Probability and Statistics: Data collection is a powerful way to determine the likelihood of an event occurring. Students organize data, choose an appropriate method to display the data, and interpret the data to make decisions and predictions and to solve problems.

KNOWLEDGE AND SKILLS	PERFORMANCE DESCRIPTIONS
12. The student uses probability to describe the experimental results of a simple event.	12.a. The student uses fractions to describe the experimental results of a simple event. 12.b. The student uses the experimental probabilities to make predictions
13. The student describes and compares sets of data in a variety of ways.	13.a. The student uses mode, median, and range to describe and compare sets of data.
14. The student solves problems by collecting, organizing, displaying, and interpreting sets of data.	14.a. The student uses tables of related number pairs to make line graphs. 14.b. The student interprets and compares information from circle, bar, and line graphs.

BASIC UNDERSTANDING

F. Underlying Mathematical Processes: Many processes underlie all content areas in mathematics. Problem solving, language and communication, connections within and outside mathematics, and formal and informal reasoning must be woven into each of the other basic understandings. Students also will use technology and multiple representations as they do mathematics.

GRADE LEVEL: 5

CONTENT AREA: MATHEMATICS

KNOWLEDGE AND SKILLS	PERFORMANCE DESCRIPTIONS
15. The student solves problems that arise from everyday experiences and investigations in other disciplines.	15.a. The student solves problems using a problem-solving model that incorporates understanding the problem, making a plan, carrying out the plan, and looking back to evaluate the solution. 15.b. The student selects or develops an appropriate problem-solving strategy, including draw a picture, look for a pattern, systematic guess and check, act it out, make a table, work a simpler problem, or work backwards to solve problems. 15.c. The student selects tools, such as real objects, manipulatives, and technology, to solve problems.
16. The student communicates using informal and formal vocabulary and symbols.	16.a. The student explains and records his or her reasoning using objects, words, pictures, symbols, and/or technology. 16.b. The student describes everyday situations using mathematical language and symbols.
17. The student uses logical reasoning to justify conclusions and solution processes.	17.a. The student justifies why an answer is reasonable. 17.b. The student makes generalizations from patterns or sets of examples and nonexamples created with appropriate tools.
18. The student connects mathematics to everyday experiences, to activities in and outside of school, and with other disciplines.	18.a. The student identifies and applies mathematics in everyday situations and other disciplines.

Chapter 111. Texas Essential Knowledge and Skills for Mathematics

Statutory Authority: The provisions of this Chapter 111 issued under the Texas Education Code, §28.002, unless otherwise noted.

Subchapter C. Grades 9-12

§111.31. Implementation of Texas Essential Knowledge and Skills for Mathematics, Grades 9-12.

The provisions of this subchapter shall be implemented beginning September 1, 1998, and at that time, shall supersede §75.63(e)-(g) of this title (relating to Mathematics).

Source: The provisions of this §111.31 adopted to be effective September 1, 1996, 21 TexReg 7371.

§111.32. Algebra I (One Credit).

(a) Basic understandings.

(1) Foundation concepts for high school mathematics. As presented in Grades K-8, the basic understandings of number, operation, and quantitative reasoning; patterns, relationships, and algebraic thinking; geometry; measurement; and probability and statistics are essential foundations for all work in high school mathematics. Students will continue to build on this foundation as they expand their understanding through other mathematical experiences.

(2) Algebraic thinking and symbolic reasoni ng. Symbolic reasoning plays a critical role in algebra; symbols provide powerful ways to represent mathematical situations and to express generalizations. Students use symbols in a variety of ways to study relationships among quantities.

(3) Function concepts. Functions represent the systematic dependence of one quantity on another. Students use functions to represent and model problem situations and to analyze and interpret relationships.

(4) Relationship between equations and functions. Equations arise a s a way of asking and answering questions involving functional relationships. Students work in many situations to set up equations and use a variety of methods to solve these equations.

(5) Tools for algebraic thinking. Techniques for working with functions and equations are essential in understanding underlying relationships. Students use a variety of representations (concrete, numerical, algorithmic, graphical), tools, and technology, including, but not limited to, powerful and accessible hand-held calculators and computers with graphing capabilities and model mathematical situations to solve meaningful problems.

(6) Underlying mathematical processes. Many processes underlie all content areas in mathematics. As they do mathematics, students continually use problem-solving, computation in problem-solving contexts, language and communication, connections within and outside mathematics, and reasoning, as well as multiple representations, applications and modeling, and justification and proof.

(b) Foundations for functions: knowledge and skills and performance descriptions.

(1) The student understands that a function represents a dependence of one quantity on another and can be described in a variety of ways. Following are performance descriptions.

(A) The student describes independent and dependent quantities in functional relationships.

(B) The student gathers and records data, or uses data sets, to determine functional (systematic) relationships between quantities.

(C) The student describes functional relationships for given problem situations and writes equations or inequalities to answer questions arising from the situations.

(D) The student represents relationships among quantities using concrete models, tables, graphs, diagrams, verbal descriptions, equations, and inequalities.

(E) The student interprets and makes inferences from functional relationships.

(2) The student uses the properties and attributes of functions. Following are performance descriptions.

(A) The student identifies and sketches the general forms of linear ($y = x$) and quadratic ($y = x^2$) parent functions.

(B) For a variety of situations, the student identifies the mathematical domains and ranges and determines reasonable domain and range values for given situations.

(C) The student interprets situations in terms of given graphs or creates situations that fit given graphs.

(D) In solving problems, the student collects and organizes data, makes and interprets scatterplots, and models, predicts, and makes decisions and critical judgments.

(3) The student understands how algebra can be used to express generalizations and recognizes and uses the power of symbols to represent situations. Following are performance descriptions.

(A) The student uses symbols to represent unknowns and variables.

(B) Given situations, the student looks for patterns and represents generalizations algebraically.

(4) The student understands the importance of the skills required to manipulate symbols in order to solve problems and uses the necessary algebraic skills required to simplify algebraic expressions and solve equations and inequalities in problem situations. Following are performance descriptions.

(A) The student finds specific function values, simplifies polynomial expressions, transforms and solves equations, and factors as necessary in problem situations.

(B) The student uses the commutative, associative, and distributive properties to simplify algebraic expressions.

(c) Linear functions: knowledge and skills and performance descriptions.

(1) The student understands that linear functions can be represented in different ways and translates among their various representations. Following are performance descriptions.

(A) The student determines whether or not given situations can be represented by linear functions.

(B) The student determines the domain and range values for which linear functions make sense for given situations.

(C) The student translates among and uses algebraic, tabular, graphical, or verbal descriptions of linear functions.

(2) The student understands the meaning of the slope and intercepts of linear functions and interprets and describes the effects of changes in parameters of linear functions in real-world and mathematical situations. Following are performance descriptions.

(A) The student develops the concept of slope as rate of change and determines slopes from graphs, tables, and algebraic representations.

(B) The student interprets the meaning of slope and intercepts in situations using data, symbolic representations, or graphs.

(C) The student investigates, describes, and predicts the effects of changes in m and b on the graph of $y = mx + b$.

(D) The student graphs and writes equations of lines given characteristics such as two points, a point and a slope, or a slope and y-intercept.

(E) The student determines the intercepts of linear functions from graphs, tables, and algebraic representations.

(F) The student interprets and predicts the effects of changing slope and y-intercept in applied situations.

(G) The student relates direct variation to linear functions and solves problems involving proportional change.

(3) The student formulates equations and inequalities based on linear functions, uses a variety of methods to solve them, and analyzes the solutions in terms of the situation. Following are performance descriptions.

(A) The student analyzes situations involving linear functions and formulates linear equations or inequalities to solve problems.

(B) The student investigates methods for solving linear equations and inequalities using concrete models, graphs, and the properties of equality, selects a method, and solves the equations and inequalities.

(C) For given contexts, the student interprets and determines the reasonableness of solutions to linear equations and inequalities.

(4) The student formulates systems of linear equations from problem situations, uses a variety of methods to solve them, and analyzes the solutions in terms of the situation. Following are performance descriptions.

(A) The student analyzes situations and formulates systems of linear equations to solve problems.

(B) The student solves systems of linear equations using concrete models, graphs, tables, and algebraic methods.

(C) For given contexts, the student interprets and determines the reasonableness of solutions to systems of linear equations.

(d) Quadratic and other nonlinear functions: knowledge and skills and performance descriptions.

(1) The student understands that the graphs of quadratic functions are affected by the parameters of the function and can interpret and describe the effects of changes in the parameters of quadratic functions. Following are performance descriptions.

(A) The student determines the domain and range values for which quadratic functions make sense for given situations.

(B) The student investigates, describes, and predicts the effects of changes in a on the graph of $y = ax^2$.

(C) The student investigates, describes, and predicts the effects of changes in c on the graph of $y = x^2 + c$.

(D) For problem situations, the student analyzes graphs of quadrati c functions and draws conclusions.

(2) The student understands there is more than one way to solve a quadratic equation and solves them using appropriate methods. Following are performance descriptions.

(A) The student solves quadratic equations using concrete models, tables, graphs, and algebraic methods.

(B) The student relates the solutions of quadratic equations to the roots of their functions.

(3) The student understands there are situations modeled by functions that are neither linear nor quadratic and models the situations. Following are performance descriptions.

(A) The student uses patterns to generate the laws of exponents and applies them in problem-solving situations.

(B) The student analyzes data and represents situations involving inverse variation using concrete models, tables, graphs, or algebraic methods.

(C) The student analyzes data and represents situations involving exponential growth and decay using concrete models, tables, graphs, or algebraic methods.

Source: The provisions of this §111.32 adopted to be effective September 1, 1996, 21 TexReg 7371.